RESEARCH LETTER

Relationship between education and cardiovascular risk score

Krystyna Kozakiewicz[1], Ewa Podolecka[1], Marcin Syzdół[1], Jerzy Piwoński[2], Wojciech Bielecki[3], Andrzej Pająk[4]

1 3rd Department of Cardiology, Upper Silesian Centre of Cardiology, Medical University of Silesia, Katowice, Poland
2 Department of Epidemiology, Cardiovascular Prevention and Health Promotion, Institute of Cardiology, Warsaw, Poland
3 Department of Preventive and Social Medicine, Medical University of Lodz, Łódź, Poland
4 Department of Epidemiology and Population Studies, Institute of Public Health, Jagiellonian University Medical College, Kraków, Poland

Introduction Cardiovascular diseases are among the main causes of morbidity and mortality worldwide. One of the key factors determining the occurrence of cardiovascular diseases is the patient's socioeconomic status.[1] The parameters used in epidemiological studies to determine the socioeconomic status include education, income, profession, and employment. Studies on the relationship between social variables and the occurrence of coronary artery disease have been conducted mainly in the United States and Western European countries. In Poland, there have been few publications concerning this subject, focusing on patients living in certain regions of the country.[2,3] The aim of this study was to assess the relationship between education and cardiovascular risk.

Patients and methods The present study was a part of the Multi-center National Population Health Examination Survey (WOBASZ).[4] The study group consisted of randomly selected adults of both sexes aged from 20 to 74 years. The study design included a questionnaire, physical examination, and laboratory tests.

Hypertension was defined as systolic blood pressure of 140 mmHg or higher and/or diastolic pressure of 90 mmHg or higher, and the use of antihypertensive drugs. Hypercholesterolemia was defined as total cholesterol levels of 190 mg/dl or higher; increased low-density lipoprotein (LDL) cholesterol levels were defined as 115 mg/dl or higher; and decreased high-density lipoprotein levels were defined as less than 40 mg/dl in men and less than 46 mg/dl in women. Hypertriglyceridemia was defined for values equal or above 150 mg/dl. Diabetes was defined as glucose levels of 126 mg/dl or higher in fasting patients or patients who use glucose-lowering medications, and obesity was defined for a body mass index (BMI) of 30 kg/m^2 or higher. The level of education was classified as primary, secondary, and higher. Patients had their cardiovascular risk estimated using the SCORE algorithm, which is designed for risk assessment in primary prevention and can be applied to people without a diagnosed cardiovascular disease. In this model, the risk is defined as the probability of cardiovascular events within the following 10 years, culminating in death. A high-risk group included subjects without a clinical cardiovascular disease, whose SCORE was equal or above 5% or, in the case of diabetes, subjects with total cholesterol levels of 320 mg/dl (7 mmol/l) or higher, LDL cholesterol levels of 240 mg/dl (7 mmol/l) or higher, and blood pressure of 180/110 mmHg or higher.[5]

Statistical analysis Numeric variables differed significantly from normal distribution and were described using nonparametric tests as a median (range). With regard to categorical variables, the frequency of each category was presented as percentage. The differences in the incidence of individual risk factors for cardiovascular disease depending on a level of education were compared using the χ^2 test and Fisher test. This analysis was conducted for the whole study group and separately for men and women. The predictive value for particular groups of different education levels was determined using logistic regression. The results were presented as an odds ratio (OR) (95% confidence interval [CI]). A P value of less than 0.05 was considered statistically significant.

Results The study group comprised 2027 subjects, including 929 men (45.8%) at a median age of 46 years (range, 20–74 years) and 1098 women (54.2%), also at a median age of 46 years (range, 20–74 years). Risk factors for cardiovascular

Correspondence to:
Ewa Podolecka, MD, PhD, III Oddział Kardiologii, Górnośląski Ośrodek Kardiologii, Śląski Uniwersytet Medyczny, ul. Ziołowa 45/47, 40-635 Katowice, Poland, phone: +48 32 252 39 30, e-mail: epodolecka@interia.pl
Received: February 9, 2016.
Revision accepted: April 14, 2016.
Published online: May 27, 2016.
Conflict of interest: none declared.
Pol Arch Med Wewn. 2016; 126 (5): 369-371
doi:10.20452/pamw.3414

TABLE 1 Presence of risk factors for cardiovascular disease depending on the education level in the whole study group (G) and separately in the groups of women (W) and men (M)

Variable	Education level, n (%)				*P* value
	group	primary	secondary	higher	
number of subjects	G	1191 (58.8)	604 (29.8)	232 (11.4)	–
	M	594 (63.9)	245 (26.4)	90 (9.7)	–
	W	597 (54.4)	359 (32.7)	142 (12.9)	–
hypertension	G	535 (45.0)	173 (28.6)	64 (27.6)	<0.00001
	M	274 (46.1)	92 (37.6)	36 (40.0)	0.06
	W	261 (43.8)	81 (22.6)	28 (19.7)	<0.00001
hypercholesterolemia	G	779 (65.5)	351 (58.1)	112 (48.3)	<0.00001
	M	383 (64.5)	138 (56.3)	49 (54.4)	0.03
	W	396 (66.6)	213 (59.3)	63 (44.4)	<0.00001
↑ LDL cholesterol	G	677 (58.4)	311 (52.3)	101 (44.1)	0.0001
	M	318 (55.8)	133 (55.7)	50 (56.2)	1.0
	W	359 (60.9)	178 (50.0)	51 (36.4)	<0.00001
↓ HDL cholesterol	G	225 (18.9)	106 (17.6)	44 (19.1)	0.76
	M	118 (20.0)	53 (21.6)	23 (25.6)	0.44
	W	107 (18.0)	53 (14.8)	21 (14.9)	0.37
hypertriglyceridemia	G	364 (30.6)	148 (24.5)	45 (19.4)	0.0003
	M	219 (36.9)	77 (31.4)	29 (32.2)	0.27
	W	145 (24.4)	71 (19.8)	16 (11.3)	0.002
diabetes	G	97 (8.1)	20 (3.3)	6 (2.6)	0.00002
	M	47 (7.9)	12 (4.9)	2 (2.2)	0.06
	W	50 (8.4)	8 (2.2)	4 (2.8)	0.0001
obesity (BMI ≥30 kg/m^2)	G	334 (28.1)	111 (18.4)	40 (17.2)	<0.00001
	M	131 (22.1)	49 (20)	22 (24.4)	0.65
	W	203 (34.1)	62 (17.3)	18 (12.7)	<0.00001
smoking	G	501 (42.1)	210 (34.8)	57 (24.6)	<0.00001
	M	310 (52.2)	107 (43.7)	28 (31.1)	0.0003
	W	191(32.0)	103 (28.7)	29 (20.4)	0.02

Abbreviations: BMI, body mass index; HDL, high-density lipoprotein; LDL, low-density lipoprotein

disease depending on the education level in the study groups are presented in TABLE 1. Hypercholesterolemia and smoking were more likely to be observed in men and women with primary education. Increased blood pressure, LDL cholesterol, and triglyceride levels, as well as diabetes and obesity were more likely to be observed in women with primary education (TABLE 1). We did not observe such an association in men.

A subgroup of 1821 subjects (816 men and 1005 women) who were not diagnosed with any cardiovascular diseases was identified in the study group, and their cardiovascular risk was estimated using the SCORE risk algorithm. Both in men and women with low education level, the cardiovascular risk score was significantly higher in comparison with the other groups. The whole study demonstrated a negative correlation between education of men and women and the prevalence of cardiovascular risk. Logistic regression showed that the low education level is a significant predictor of the presence of high cardiovascular risk across the entire group and subgroups of men and women. The analysis showed that the high risk of cardiovascular disease decreased with a higher education level in the whole study group (OR, 0.72; 95% CI, 0.61–0.84; P = 0.0001), men (OR, 0.8; 95% CI, 0.64–0.99; P = 0.04), and women (OR, 0.74; 95% CI, 0.57–0.96; P = 0.02).

Discussion Our study confirmed the relationship between education and cardiovascular risk. In patients with lower education level, this risk was significantly higher. This observation correlates well with the prevalence of risk factors for atherosclerosis in the groups. In patients with higher education level, the risk factors were observed less often than in patients with lower education level. The difference in the presence of these factors was more pronounced in women. These data are consistent with the majority of reports that confirmed the link between education and the prevalence of the classic cardiovascular risk factors. The results of several studies suggested that differences in the health status of the population was, among other factors, caused by a varying socioeconomic status.[6] The CHEWE study confirmed that the difference in cardiovascular risk

between socioeconomic groups is partly caused by the difference in the prevalence of risk factors such as hypertension, hypercholesterolemia, and, in particular, smoking.[7] The study demonstrated that increased triglyceride levels, diabetes, and obesity are more likely to be observed in women with primary education. Our findings are also consistent with the results of the MONICA study, in which a correlation between primary education and higher BMI among women was demonstrated.[8]

Low education is often accompanied by unhealthy lifestyle, which is associated with an increase in other classic risk factors for atherosclerosis and leads to an increase in cardiovascular risk. The present report as well as numerous other studies confirmed the theory that low level of education is associated with a higher prevalence of risk factors.[9-11] In Central and Eastern European countries, including Poland, the relationship between education and the risk of cardiovascular mortality was confirmed by MONICA and HAPIEE studies, among others. However, after considering the risk assessment using the SCORE algorithm, the results were not statistically significant. Moreover, including education to assess the cardiovascular risk using the SCORE algorithm did not improve the prediction of cardiovascular mortality.[12]

In conclusion, in this study we found a negative correlation between a low education level and cardiovascular risk factors. This relationship was more significant in women. What is more, the study demonstrated a correlation between a low level of education and a high risk of cardiovascular mortality.

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